1896MNRAS..56..213.

a change in the numbers and areas of the spots, but also in the zones which they affect; so that at the beginning of a new cycle the spots are found chiefly in high latitudes, but as the cycle progresses ever in lower latitudes, until at length the equator is reached. A feature of this "law of zones," which he pointed out, is the associated fact that the actual Sun-spot cycles overlap, the new current having its beginning before the expiring one has run out to its close. Besides his own observation of Sun-spots, Professor Spörer was indefatigable in searching out early records, and in two papers entitled, "Ueber die Periodicität der Sonnenflecken seit dem Jahre 1618," and "Sur les Différences que présentent l'Hémisphère nord, et l'Hémisphère sud du Soleil," communicated respectively to the Royal Leopold-Caroline Academy and to the *Bulletin Astronomique*, he traced back his "law of zones" to the year 1619, and showed that although there is on the whole an even balance between the number of spots in the two hemispheres, yet in three periods of the Sun's history the southern spots have predominated. A third and most interesting fact brought out in these papers was that of the apparent suspension of both the law of the spot cycle and the "law of zones" for about 70 years at the end of the seventeenth century. Dr. Spörer's regular observations of Sun-spots from his rotation No. 1 in 1861 January to rotation 445 in 1894 January are published in six volumes. The first two, or the Anclam observations, were issued as the thirteenth volume and its appendix of the publications of the *Astronomische Gesellschaft* in 1874 and 1876. The remaining four are contained in the *Publications of the Astrophysical Observatory of Potsdam* as vol. i., No. 1; vol. ii., No. 5; vol. iv., No. 17; and vol. x., No. 32. These volumes are illustrated by charts showing, rotation by rotation, the arrangement of the spots in longitude and latitude, in a somewhat similar form to that adopted by Carrington.

Professor Spörer was elected an Associate of the Royal Astronomical Society on 1886 November 12.

FRIEDRICH TIETJEN was born on 1832 October 15 at Garnhold, a village of Westerstede parish, in the Duchy of Oldenburg. His father owned a small farm, and Friedrich, on the early death of his elder brother, remained the eldest of six children and heir to the property. He was educated at first in a volksschule, and here showed great inclination and aptitude for figures; but this fact had little interest for his father, who was chiefly concerned that his son should be a good farmer, and to that end required him, even before he left school at the age of fifteen, to work in farm and field like other boys. Mathematics had, however, a special attraction for him, and he taught himself from such books as he could borrow, though his studies could only be pursued at night after a hard day's work, and if not perhaps unknown to, at any rate much against the will of, his father. It was contrary to all traditions of the family that the eldest son should resign

1896MNRAS..56..213.

his birthright, but the father determined that the farm should at least be handed over to a sturdy farmer, and not to a student. This was a trying time for the young man, who could with difficulty conceal his own inclinations. A chance of escape suggested itself in his military service, for he hoped to get to Oldenburg, and there find opportunity for further education. But he was rejected from physical weakness, and his grief and despair were so great that his father, who had hitherto refused to listen to the advice of his old friends, at last realised that his son would never make a farmer. He accordingly yielded to his son's wishes, on the condition that he resigned his birthright. Tietjen forthwith went to the high school at Oldenburg, and found in Professor Harms an exceptionally able instructor in those mathematical studies which he loved. Thence he proceeded to the Collegium Carolinum in Brunswick, where his diligence and ability were so manifest that in 1859 he entered the University, though at the advanced age of twenty-seven.

Next he went to Göttingen, and a year later to Berlin; and here it was that his love for astronomy was awakened. He began in 1861 to busy himself with observations and reductions of small planets and comets, and in 1862 was appointed by Professor Encke second assistant in the Observatory, with charge of the great refractor and magnetic observations. In 1865 Professor Foerster succeeded to the directorship of the Observatory, and Tietjen became first assistant, in which position he remained until 1874, when he was appointed Editor of the *Berlin Jahrbuch* and Director of the new Rechen-Institut, founded in connection with the Observatory. With Professor Foerster he undertook the management of a school of instruction in scientific computations; and in 1878 succeeded Professor Bremiker as Editor of the *Nautisches Jahrbuch*.

Tietjen worked very hard during his thirteen years as assistant at the Observatory, especially at observations of small planets, to which the *Berlin Jahrbuch* pays special attention. The situation of the Observatory in the midst of the city made such work very difficult and laborious. In 1866 he had the good fortune to find one planet—*Semele*—himself, in watching the recently discovered *Io*. From the year 1869 he did a large amount of work in observing comparison stars with the large transit circle. The accounts of his work of this kind, as well as of his magnetic observations at Berlin, in the *Astronomische Nachrichten* and the publications of the Observatory, testify to their great value.

Some other matters claimed his attention. In the course of the Mid-European Survey it was resolved to fix the astronomical position of some point in Oldenburg, and the selection fell on Dangast, the position of which was determined by Tietjen in the summers of 1866 and 1867, with the help of Professor Albrecht for the longitude work. In 1868 Tietjen spent some time in Gotha, working at perturbations under Hansen's superintendence; and

1896MNRAS..56..213.

undertook some calculations for a new theory of *Jupiter*, which were, however, interrupted by the expedition to observe the Total Solar Eclipse of 1868 August 18. Two expeditions were sent—to Arabia and to India—by the Prussian Government.

He also undertook spectroscopic observations on several occasions. In 1868–9 he made an unsuccessful series of attempts to see protuberances without a spectroscope by absorption of the general light of the Sun. In 1872, at nearly the same time as Respighi, he found that the strongest line in the spectrum of the zodiacal light can be seen in all parts of the sky. And, finally, in 1873 he measured the hydrocarbon bands in the spectrum of Encke's Comet with a spectroscope designed for the purpose.

From 1874, when Tietjen undertook the editorship of the *Berliner Jahrbuch* (first jointly with Foerster, later alone) and the directorship of the Rechen-Institut, he practically ceased observing, and turned his attention to theory and computation. He was a ready and most accurate computer, and undertook many investigations of his own, in addition to the heavy regular work. The *Jahrbuch* under his editorship kept pace with the advances of knowledge; and several appendices contain personal contributions of great value, chiefly relating to the determinations of planetary orbits and improvements in the methods of reduction.

Tietjen was an indefatigable worker. He had a wonderful faculty for solving instrumental and mechanical problems, of great use in the Observatory work. The number of his publications would have been greater could he have found opportunity to carry out all his ideas. Against his undoubted faculty for arranging them, and condensing them into scientific results, must be set a certain natural disregard of form, perhaps due to his exceptional early life and late development, which he could never shake off, and which appeared also in his private life. A somewhat rough exterior hid, however, a heart of gold. By his colleagues, friends, pupils, and by his countrymen of all ranks, was he beloved and respected, and the simplicity and uprightness of his character will long live in their memory.

He was of sound constitution, and though he did not spare himself, never ill. About the end of the eighties he began to suffer from shortness of breath, which gradually developed and, complicated by heart-disease, made his last years sad and painful. Visits to baths and a winter in Italy (1894–5) only brought temporary relief, and on 1895 June 21 he died.

Tietjen was elected an Associate of our Society on 1881 June 10, together with Gyldén, E. C. Pickering, Tempel, and Tisserand. His name occurs four times in the index to volumes i. to xxix. of the *Monthly Notices*, and twice in the index just published, as contributing elements of minor planets, but these elements were always copied from the *Astronomische Nachrichten*.

[For the above particulars of his life and work the Council is indebted to his close personal friend Dr. H. Romberg, of Berlin.]